

Claims

Sub B2 In a device for forwarding data packets, having a storage containing storage locations, a method comprising the steps of:

5 providing header data for a destination of a network layer packet;
 using multiple bits from the header data as an index to locate a selected
 one of the storage locations that provides information regarding how the device
 should forward the network layer packet; and
 employing the information provided by the selected storage location to
10 forward the network layer packet toward the destination.

2. The method of claim 1 wherein the selected storage location contains an
instruction regarding how the device should forward the network layer packet and
wherein the instruction is executed in the employing step.

15 3. The method of claim 1 wherein more than a byte from the destination address is
used as the index.

20 4. The method of claim 1 wherein the network layer packet contains a header and
wherein the method further comprises the step of extracting information address from
the header.

Sub B2 5. The method of claim 1 wherein the packet is an IP packet.

Sub B2 25 In a device for forwarding an Internet Protocol (IP) packet toward a destination
having a destination address containing a sequence of bits, a method comprising the
steps of:

30 providing a first forwarding lookup and a second forwarding lookup;
 using a prefix of multiple bits from the destination address of the IP
 packet as an index to locate a first entry in the first forwarding lookup;
 where the first entry in the first forwarding lookup provides direction to
 the second forwarding lookup, using a next sequential set of bits following the
 prefix in the destination address as an index to locate a second entry in the
 second forwarding lookup, said second entry having contents; and
35 employing the contents of the second entry in forwarding the IP packet
toward the destination address.

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7. The method of claim 6 wherein the step of employing the contents of the second entry comprises executing an instruction contained in the second entry to forward the IP packet toward the destination address.

8. The method of claim 6 wherein the first entry contains an instruction to use the second forwarding lookup.

9. The method of claim 6 wherein the method further comprises the step of providing a third forwarding lookup and wherein the step of employing the contents of the second entry comprises identifying that the third forwarding lookup should be used in forwarding the IP packet.

10. The method of claim 9 wherein the method further comprises the steps of employing a final sequential set of bits in the destination address following the next sequential set of bits in the destination address as an index to locate a third entry in the third forwarding lookup and employing the contents of the third entry in forwarding the IP packet toward the destination address.

11. The method of claim 6 wherein the device includes an application specific integrated circuit (ASIC) and wherein the ASIC performs the steps of the method.

12. In a switch having a memory in a network that employs a connectionless network protocol, a method of forwarding a data packets, each having an associated destination address comprising the steps of:

providing a forwarding lookup with locations in the memory, wherein the locations are indexed by multiple bits; and

for each data packet to be forwarded, employing bits in the destination address to locate and access at least one location in the forwarding lookup to forward the data packet, wherein fewer locations in the forwarding lookup are located and accessed than bits in the associated destination address.

13. The method of claim 12 wherein the data packets are Internet protocol (IP) packets.

14. The method of claim 12 wherein at most three locations in the forwarding lookup are used to forward any of the data packets.

5 A device for forwarding network layer packets to destinations wherein the packets include header data, comprising:

a first lookup structure holding entries that provide information regarding how to forward network layer packets to their destinations, said entries being indexed by multiple bits; and

10 a forwarding controller for using multiple bits from the header data as indices to locate entries in the first lookup structure and for using the entries in the first lookup structure in directing the forwarding of the network layer packets to the destinations.

15 16. The device of claim 15 wherein the forwarding controller includes a processor for executing instructions and wherein the entries on the first forwarding lookup structure includes instructions to be executed by the processor to provide information regarding how to forward network layer packets to their destinations.

20 17. The device of claim 15 wherein the entries in the first lookup structure are indexed by more than a byte of bits.

18. The device of claim 17 wherein the entries in the first lookup structure are indexed by two bytes.

25 19. An apparatus for forwarding IP packets, comprising:
multiple lookup structures for assisting in the forwarding of the IP packets; and
a processor for executing the instructions in the entries of the lookup structures to forward the IP packets.

30 20. The apparatus of claim 19 wherein the apparatus is an application specific integrated circuit (ASIC).

21. A switch/router for directing IP packets toward destinations, comprising:

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a first lookup array containing entries indexed by leading bits of destination addresses for IP packets, each entry containing an instruction to assist in forwarding an IP packet towards a destination;

5 a second lookup array containing entries indexed by a successive set of bits that follow the leading bits in the destination addresses for IP packets, each entry containing an instruction to assist in forwarding an IP packet towards a destination;

10 a third lookup array containing entries indexed by a set of trailing bits that follow the successive set of bits in the destination addresses for IP packets, each entry containing an instruction to assist in forwarding an IP packet; and

15 a forwarding engine for forwarding IP packets to destinations, wherein for each IP packet being forwarded, said forwarding engine accesses at least one entry in the lookup arrays indexed by a destination address for the IP packet being forwarded and executing the instruction contained in the entry that is accessed.

22. The switch/router of claim 21 further comprising input ports and interface structures that hold information regarding the input ports on which IP packets arrive.

20 23. The switch/router of claim 22 wherein the interface structures contain instructions for directing the forwarding engine to access the first lookup array.

24. In a device for forwarding data packets wherein the device includes a storage having storage locations, a computer-readable medium holding computer-executable instructions for performing a method, comprising the steps of:

25 using multiple bits from header data for an network layer packet as an index to locate a selected one of the storage locations that provides information regarding how the device should forward the network layer packet; and
30 employing the information provided by the selected storage location to forward the network layer packet toward the destination.

25. The computer-readable medium of claim 24 wherein the selected storage location contains an instruction regarding how the device should forward the network layer packet and wherein the instruction is executed in the employing step.

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26. The computer-readable medium of claim 24 wherein more than a byte from the destination address is used as the index.

27. The computer-readable medium of claim 24 wherein the network layer packet
5 contains a header and wherein the method further comprises the step of extracting the information from the header.

28. The computer readable medium of claim 24 wherein the packet is an IP packet.

10 29. In a device for forwarding an Internet Protocol (IP) packet toward a destination having a destination address composed of a sequence of bits, said device including a first forwarding lookup and a second forwarding lookup, a computer-readable medium holding computer-executable instructions for performing a method, comprising the steps of:

15 using a prefix of multiple bits from the destination address of the IP packet as an index to locate a first entry in the first forwarding lookup;
where the first entry in the first forwarding lookup provides direction to the second forwarding lookup, using a next sequential set of bits following the prefix in the destination address as an index to locate a second entry in the
20 second forwarding lookup, said second entry having contents, and
employing the contents of the second entry in forwarding the IP packet toward the destination address.

30. The computer readable medium of claim 29 wherein the step of employing the
25 contents of the second entry comprises executing an instruction contained in the second entry to forward the IP packet toward the destination address.

31. The computer-readable medium of claim 29 wherein the first entry contains an
instructions to use the second forwarding lookup.

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